

## Chapter 3

# Reforestation, Conservation and Livelihoods

Trees owned and grown by the poor are not a panacea, but the evidence assembled indicates that they have more potential for reducing deprivation than has been recognized, and their potential is increasing. Seen from the point of view of the poor themselves, they are like savings bank accounts with low initial deposits and high rates of appreciation. Where ownership and rights to harvest and sell are secure, poor people plant more and harvest less than expected.

Chambers and Leach (1989, p. 341)

## Introduction

Conservationists tend to view deforestation largely in terms of its impact on biodiversity. But, because of deforestation, there is an equally compelling human tragedy unfolding as well. Many people used these forests in the past and are now trying to make a living in the degraded forests and lands that have replaced them. Their numbers are large and some estimates suggest there are 300 million people across the tropical world dependent on degraded or secondary forest for their livelihoods (ITTO 2002). Within Asia, Poffenberger (2006) has estimated there are 140 million 'forest-dependent' people (or 30% of the population) in Cambodia, Indonesia, the Philippines, Thailand and Vietnam alone. Some of these people live within the residual forests as shifting cultivators and hunter-gatherers. Others, such as farmers and artisans, live outside the forests but draw on them for various resources. When forests are degraded or lost it is the poorer people in these rural communities who are usually the most adversely affected. It is true that they themselves have sometimes contributed to the degradation process. But, as seen in Chapter 2, more often than not, degradation has been caused by the activities of the rich and more powerful members of society or by a lack of concern by governments about how forests and lands are managed.

The question is, what to do about this unfolding tragedy? The decline in forest cover has led some conservationists to press for more of the remaining forests being placed in protected areas (Terborgh 1999). Others have argued

that it is equally important to find ways of dealing with the large numbers of poor people now living in rural areas (Adams et al. 2004; Colchester 2000; Fisher et al. 2008). But might both problems be addressed by reforesting some of the degraded lands that have now accumulated? New forests around parks could act as buffers and protect the parks from agricultural clearings and fire. And new forests could create an economic resource that could help improve rural livelihoods. In the context of the Millennium Development Goals (World Bank 2004), reforestation might be a way of reconciling Goal 1 (to eradicate extreme poverty and hunger) and Goal 7 (ensuring environmental sustainability).

However, who could do this? Government forest departments have traditionally undertaken some plantation establishment but few have either the funds or the capacity to mount reforestation operations on the scale now needed. In fact, in recent years the rate of planting by government agencies appears to be declining. On the other hand, private timber companies are becoming more involved in plantation establishment and many of their plantations are large and exceed 100,000 ha. But the value of most of these plantations is often limited; their economic benefits are not widely distributed across the community and they usually provide only modest conservation benefits because they rely on exotic species grown on very short rotations.

A third group potentially able to undertake reforestation are smallholders living in these deforested lands. In the past many have planted trees in gardens or woodlots. Most of these plantings have been carried out for subsistence purposes but their planting designs have usually generated rather more conservation benefits than the simple monocultures used by government agencies and private companies. Might they also undertake commercial reforestation in a way that improved their livelihoods but also generated some conservation outcomes?

One obvious constraint on them doing so is that many of these people are poor; food is sometimes scarce, their access to health services is limited and they commonly live in a harsh economic environment. Most have no access to financial institutions and high inflation means the cost of saving money is high. If they are to contribute to the reforestation of degraded lands and benefit from doing so they will need assistance.

This chapter examines the relationships between rural smallholders, biodiversity conservation and reforestation. It begins by examining the ways in which many communities have traditionally used the resources supplied by natural forests for subsistence and trade. It then goes on to consider how, following deforestation, tree planting might be carried out to re-supply certain forest resources in a way that improves livelihoods and, at the same time, generates some conservation benefits as well. It concludes by examining the way reforestation might be carried out by communities and that done by individual households. But first, since many smallholders are considered to be living in 'poverty', it is useful to start the discussion by clarifying just what this means.

## Defining and Assessing Rural Poverty

There is a good deal of debate over just how to define and measure poverty (Angelsen and Wunder 2003). One definition describes poverty as being subject to a pronounced deprivation of well-being. This is related to a lack of income and is accompanied by low levels of education and health, high levels of exposure to risk and a high degree of powerlessness (World Bank 2001). A commonly used and practical expression of this is to say that people living on less than US\$1 per day are living in poverty because they are unable to satisfy their basic nutritional needs. Other measures define 'poverty lines' for particular places on the basis of the money needed to purchase a certain amount of food (e.g. 2,100 calories per person per day – the 'food poverty line') or a 'general poverty line' which includes the money needed to buy food plus a certain amount of non-food items. Some poverty analysts assess poverty using surveys of education, occupation or asset ownership (e.g. the number of cattle the household owns, whether a household has a motorbike or TV, etc.). The incidence of poverty in a region is then the frequency of people in a community who fall below these various thresholds whether they are externally or locally defined.

But poverty is more than just having a low income and poor people themselves often have a more multi-dimensional view of their problem. Thus some Laotian villages regarded 'poverty' as not having enough rice or having too few cattle. But they also recognized that a number of other factors including land tenure arrangements and that natural disasters contributed to declines or deficiencies in both these indicators (Whiteman 2004). Likewise, in the colonial era, many Papua New Guineans living in some of the more isolated parts of the country had adequate land and food but would have seen themselves as being 'poor' because of their lack of road access. They knew that without roads it was difficult for them to earn money by selling garden produce in a market, get access to health clinics or provide their children with an education.

In seeking a description of poverty that encompassed more than just per capita income or food intake Fisher et al. (2008) built on the earlier Sustainable Livelihoods Framework of the British Department of International Development (DFID 1999) and the analyses of the World Bank (2001) and suggested three broad descriptors – a lack of assets or capital, a sense of powerlessness and increased vulnerability to natural or economic crises. Fisher et al. (2008) provided a number of dimensions to each of these descriptors and ways in which these problems might be addressed (Table 3.1).

Hobley (1996) also made a distinction between the extremely poor, the coping poor and the improving poor. These represent a range of vulnerabilities and capacities for taking risks. As well, Rigg (2006) drew attention to the distinction between what he called 'old poverty' and 'new poverty'. The former represents the more traditional view of poverty and is the consequence of a lack of access to markets and government facilities such as education and health service. The latter is caused by the development

**Table 3.1** Factors contributing to poverty and some potential methods of overcoming these (Based on Fisher et al. 2008)

	Dimensions of poverty	Potential methods of overcoming poverty
Lack of Assets	Natural capital	Expanding assets of poor
	Human capital	Encouraging private investments
	Financial capital	Increasing market access
	Physical capital	Improving technical knowledge
	Social capital	Debt relief
Powerlessness		Restructuring aid
	Social differences	Addressing social inequities
	Inequitable access to resources or the benefits of using these	Enhance ability to participate in decision making
	Inequitable access to legal resources	Pro-poor decentralization
	Unresponsive public administrations	Public administration reform
Vulnerability	Corruption	Legal reform
	Economic crises	Diversify asset base
	Natural disasters	Develop forms of risk management
	Social disasters	Provide safety nets

process (e.g. loss of customary land, deforestation by loggers) and people's engagement with the market and the cash economy on terms that have often been unfavourable to them. In some cases traditional communities relying on subsistence agriculture were well nourished and led normal lives by their own standards but suffered once the old social networks and systems of land tenure were changed.

## Natural Forests and Livelihoods

The role of forests in improving livelihoods or in reducing poverty is complex. On the one hand, natural forests often contain commercially valuable resources. But, on the other, local people have rarely benefited from the more valuable of these resources. The most obvious example is the case of valuable timber trees where Governments have usually asserted ownership of and ignored the claims of traditional land owners. Some forest-dwelling people have even been statutorily excluded from access to timber resources to ensure privileged access by large timber companies (Sunderlin et al. 2005).

This is not the case in the Pacific where, in contrast to Asia, governments of most countries recognize traditional land and forest ownership claims. However, even under these circumstances, it has been hard for traditional communities to obtain a commercial benefit from the resources they own. Harvesting timber trees requires access to heavy machinery, finance and market knowledge and most traditional communities lack these. Communities have usually ended up selling

their timber to logging companies who have these resources. Governments have sometimes taken it upon themselves to act as intermediaries between landowners and these logging companies arguing that this is necessary to protect people from unscrupulous operators. However, in most cases, this has still meant that only a small proportion of the revenue generated by logging finds its way back to the owners with most being taken by the foreign logging companies, well-placed politicians and unprincipled village leaders. In theory these landowners are economically rich but, unfortunately, they are also politically weak.

The situation is different with non-timber-forest-products (NTFPs) such as fruits, nuts, resins, bushmeat, building materials and medicinal plants (Fig. 3.1). These have been collected for sustenance and as well as for sale and people have often benefited from doing so (Wollenberg and Ingles 1998). Mayers (2006) quotes a study by Vedeld et al. (2004) who carried out a meta analysis of 54 studies undertaken across the tropical world and found 'forest environmental income' (largely fuelwood, wild foods and fodder for animals) made an average contribution to rural household incomes of 22%. Similar findings have been reported by Wollenberg and Ingles (1998) and Lopez and Shanley (2004). NTFPs can be particularly important in making up food shortfalls at certain times of the year or during periods of emergency such as floods, droughts or in times of war.

Despite this, there has been some debate concerning the overall importance of NTFPs for people's livelihoods. Dove (1993) has argued that most forest dwellers



**Fig. 3.1** Gathering fuel and thatching material from forests and plantation areas in Vietnam (Photo: Sharon Brown)

are usually only able to get a very small proportion of the final market value of the more valuable products they harvest because middlemen and long market chains siphon off most of the profit. And others have argued that while NTFPs might be regarded as safety nets when other alternatives are limited they can also be poverty traps because people cannot significantly increase their income using these resources alone (Sunderlin et al. 2005). Morris et al. (2004) disagree and argue that, on the contrary, NTFPs can be 'ladders out of poverty'. They describe examples from Laos where simple changes in marketing arrangements for NTFPs (e.g. selling goods by weight) combined with other small-scale interventions led to substantial improvements in livelihoods over a relatively short time and a reduction in the proportion of 'poor' households in the community.

The importance of NTFPs to livelihoods can change over time; some are relatively inferior goods and are abandoned once per capita incomes rise while others are specialty products or luxury goods and the consumption of these may rise as incomes increase. In such cases the collectors often shift from working part-time to working full-time and specialise in a smaller number of products. The collection of medicinal plants is an obvious example.

There are four ways in which natural forest resources, including NTFPs, might improve the livelihoods of rural communities (Table 3.2). The first is if communities can be given legal access to the resources that forests contain and they can be assisted to manage, harvest and market these resources. This could be done by

**Table 3.2** Ways by which natural forests might be used to help alleviate rural poverty (After Sunderlin et al. 2005)

Action	Mechanism or policy
Provide legal and fair access to the forest and its resources	Protect the forest (from illegal loggers and squatters) and allow people to make use of and benefit from its resources. Provide assistance in developing appropriate forms of silviculture and management that ensure production is sustainable and that benefits are equitably shared
Increase the value of forest products (timber and NTFPs)	Use technology to increase productivity (machinery rather than hand tools), enhance prices (via improved market access and marketing arrangements) and increase local value-adding activities (e.g. small rural sawmills and furniture factories. This may require access to new sources of financial assistance
Pay for the ecosystem services provided by forests	Develop mechanism for transfer payments to people for services such as watershed protection and clean water, carbon sequestration, recreational opportunities or the biodiversity provided by their forests
Clear forest and develop alternative land uses	Use land for more profitable uses such as agriculture



providing training and loans to the community so they can carry out harvesting themselves. Alternatively, it might be done by forming partnerships between communities (who supply the resource and protect it against illegal loggers or harvesters) and, say, a timber company (who provide finance and technical skills).

A second way is if the value of forest products being harvested from the forest can be increased. For example communities would obtain a better return if they produced sawn timber rather than simply logs (Fig. 3.2). Sawn timber might be produced using small, portable sawmills (Filer and Sekhran 1998; McGrath 1998). These have had a chequered history in the Pacific because the machinery has to be maintained in often isolated situations and the timber has to be carried out of the forest and sold to a buyer willing to accept small volumes of sawn timber arriving at irregular intervals. In theory sawmilling should generate a greater cashflow but, to date, there appear to be few situations where small portable sawmills they have done so over an extended period. In the case of NTFPs, marketing cooperatives and small scale factories or processing plants could increase the return to communities (Morris et al. 2004). Some NTFPs may even be sufficiently valuable to be worth domesticating and growing in plots on farms.

A third way in which forests might used to improve livelihoods is through arranging for payments to be made for the provision of the ecosystem services supplied by forests. These services might include watershed protection, clean water, carbon sequestration and biodiversity protection. There are relatively few markets available to rural people for any of these services at present although they are likely to become more common in future. This topic will be discussed in more detail later in Chapter 9.



**Fig. 3.2** Sawn timber being produced using a chain saw and a portable frame in Solomon Islands. This allows traditional forest owners to produce boards and flitches from their own logs and so increase their income

The fourth and final way in which natural forests might be used to improve livelihoods is by clearing them and converting the land to another use such as growing cash crops. This choice has been widely adopted but is not available to everyone because most cash crops need roads to reach a market. Logging and the roads created by loggers remove this limitation which is the reason why there is often such a flurry of land clearing after logging. And cropping is not feasible if the land is unsuitable because it is too steep or relatively infertile. Needless to say, large areas of such marginal lands are still being cleared and much of the abandoned and degraded land now present in the world's tropical regions has originated in this way. By clearing these marginal lands people are increasing their risk of failure and, at the same time, losing the safety net the forests once provided.

In the early 1960s Westoby (reprinted in Westoby 1987) tried to counter such agricultural clearing by arguing that a permanently conserved and properly managed forest estate was an ideal vehicle by which rural development could be achieved. He noted that forests were a renewable resource and the use of these would sponsor industrialization (through the establishment of sawmills). This, in turn would generate rural employment and facilitate light industries associated with this timber processing (e.g. vehicle maintenance, sawmill machinery maintenance, etc.). Benefits would then flow through the rural community and improve rural livelihoods. The argument was seen as a powerful rejoinder to those who saw forests as impediments to rural development and a largely residual land use. However, some years later at the 1978 World Forestry Congress in Jakarta, he sadly acknowledged that he had been wrong (Westoby 1987). Forests had not lifted the poor out of poverty but instead the benefits had often been captured by a small expatriate and indigenous elite. Industrialisation had not developed to the degree he had expected and forests were not being managed as renewable resources. Instead, most had continued to shrink in area or become degraded, including those located within a supposed permanent forest estate.

Since that time there has been considerable debate about the role forests could have in improving rural livelihoods and reducing poverty. But the debate has become further complicated by rising concerns about the global biodiversity losses arising from deforestation.

## **Biodiversity Conservation or Livelihood Improvements?**

There is no question that biodiversity is under threat throughout the tropical world and the gravity of the situation in the Asia-Pacific region has already been discussed. Two solutions have been proposed. One is to substantially increase the size of the protected area network. In tropical forests this currently stands at about 10% (although Table 1.9 showed much higher values were present in many Asia-Pacific Countries). An increased protected area network would preferably involve new large contiguous protected areas including strict nature preserves within a matrix of 'soft' protected areas (e.g. IUCN category I-IV areas within a matrix of



category VI reserves). The proponents of an enlarged protected area network say it is only widespread ignorance of the magnitude of the threat to biodiversity and a lack of political will that prevents this being achieved.

However, enlarging the protected area network will be difficult. Many forest areas still contain significant human populations and most of these are likely to resist being forced from their customary lands. This response is already clear in the Pacific where traditional land ownership is legally recognized and no community has yet agreed to the creation of large protected areas that would constrain their future land-use options. Where governments have asserted state ownership over forest lands the establishment of large National Parks has frequently caused gross violations of human rights and the economic and the political marginalization of large numbers of people (Fisher et al. 2008). Some of these have been forcibly relocated causing a collapse of traditional management systems and a loss of access to livelihood resources. In many cases there have been increases in rural conflict and famine.

A second suggested way of improving biodiversity conservation is to enforce the protection of existing National Parks and nature reserves more strictly than has occurred in the past and prevent rural people from continuing to use forest resources within these reserves. According to this view, governments even have a duty to limit individual freedoms and move people to protect the 'common good' that undisturbed nature represents. This means removing customary landowners living within National Parks as well as illegal squatters and loggers moving in from outside (Terborgh 1999; van Schaik et al. 1997; Wilshusen et al. 2002). Terborgh (1999) has proposed the establishment of an internationally financed, elite policing group which could take over park protection since many national governments have shown they are unable to provide it to the extent needed.

If local park guards are too weak or too subject to corruption and political influence to carry out their duties effectively, internationally sponsored guards could be called in to help. As foreigners, they would be independent of local pressures and thus better able to exercise authority

(Terborgh 1999, p. 201)

Opponents have responded by saying these authoritarian views ignore the social and political realities present in most tropical forest areas (Brockington et al. 2006; Wilshusen et al. 2002). It is unlikely many governments would be in a position to adopt the stronger policing model even if they wanted to. Moreover, the numbers of people living in and around many parks are simply too large to be easily removed and re-settled. In Thailand, for example, up to one third of rural villages are close to or within protected areas and depend on them for forest or marine resources (ICEM. 2003a). The same is true in other places across the region. Others sympathetic to the problem of parks being gradually degraded over time say that that carrots are needed as well as sticks and that alternatives need to be found to draw people away from parks rather than using police to force them out.

But perhaps the key problem with both suggestions is the moral issue: is it ethically acceptable that so many millions of people continue to remain living in poverty in forested landscapes of the tropics when the standard of living in the developed world is so high? The issue is highlighted by a recent case in Vietnam where a large

World Bank project was established targeting 540 of the poorest communes in the country for various infrastructure projects (clinics, schools, roads, bridges). However, 86 selected communes were excluded because they are partially or totally within protected areas and there was concern that the new infrastructure might have adverse effects on these reserves (ICEM 2003b). It is not clear just what park managers have to offer these traditional land owners apart from sharing in the management of eco-tourism. Across the region few forest people derived any benefit from the logging that has led to the deforestation crisis and it is unfair that they should now be expected to carry the burden of conserving much the world's remaining biodiversity. Nor should they be expected to live in biological museums (Colchester 2000; Schwartzman et al. 2000; Wilshusen et al. 2002). As Kaimowitz and Sheil (2007, p. 572) argue:

For hundreds of millions of people, biodiversity is about eating, staying healthy and finding shelter. Such needs, in addition to those of the tiger and other endangered species must also be considered a conservation priority. Clearly it must not a question of either/or but rather of finding a better balance.

Just what sort of balance might be possible? Adams et al. (2004) outlined four alternative perspectives:

- *Biodiversity conservation in forests and poverty reduction are two separate realms.* Both are important but each must be pursued independent of the other. Following this viewpoint leads to a program of protecting forests by creating strictly protected nature conservation areas with some kind of matching rural development work in the agricultural matrix away from the protected areas. This carries the implication that the areas immediately surrounding protected areas are not very relevant for biodiversity conservation.
- *Biodiversity conservation is important but attempts to achieve this should not compromise efforts to eradicate poverty.* This acknowledges that conservation activities can sometimes have adverse effects on people (e.g. by forcing them off their ancestral homelands) and takes the view that ways must be found to avoid or at least compensate people who suffer in such ways. An example of this might be the development of eco-tourism activities within the new reserve that are managed by former land owners or the payment to former landowners for the ecosystem services arising from forest conservation.
- *Poverty is a critical constraint on forest conservation.* This acknowledges that conservation and poverty eradication are not separate realms. Rather, it assumes it will be impossible to achieve biodiversity conservation unless poverty is also overcome because people will have no alternative other than to continue to use the resources in protected areas. A consequence of this viewpoint might be to seek ways to improve livelihoods in buffer zones around protected areas so people have alternatives to using the protected areas.
- *Any reduction in poverty is dependent on conserving living resources and thus, on protecting biodiversity.* This view argues that there is an intimate connection between improvements in human livelihoods and the conservation of biodiversity including that found in forest areas outside the formal protected area network. Poor ecosystem health will undermine social and economic stability

and the livelihoods of rural people. It points to the need for not only protecting this biodiversity but also developing methods of achieving sustainable use of these forests to generate goods and services and improve human livelihoods.

The last two are closely linked and suggest forest conservation and poverty reduction could be tackled together through reforestation. There might even be scope for a 'win-win' outcome or, perhaps more realistically, what Fisher et al. (2008) referred to as a 'win-more-lose-less' outcome since some trade-offs will be required.

Considerable effort has been made to develop forms of interventions that explore these trade-offs. These have been termed 'integrated conservation and development projects' (ICDPs) and are essentially people-oriented approaches to conserving biodiversity. Most have been linked in some way with an existing protected area and have been based on the assumption that landholders would switch to practices not causing a loss of biodiversity if offered alternative opportunities to make a living. There has been considerable debate about the efficacy of ICPDs with many arguing that the evidence largely shows they have not achieved their purpose (i.e. the compromises struck have outweighed the benefits). Even proponents admit this; despite considerable effort there are few unambiguously successful projects that have achieved improved biodiversity conservation and also improved livelihoods (McShane and Wells 2004; Wells and McShane 2004; Wilshusen et al. 2002).

There are several possible reasons for this apparent failure. One is that too much may have been expected in too short a time. Attempts to change the economic circumstances and social relationships among large numbers of people dispersed over big areas takes time and most development projects are inherently unsuited to this. A second potential explanation is that the success of any ICDPs invariably depends on having in place the right policies, institutional frameworks and laws. But this means that failures may have been caused by policy settings and institutions operating at a national rather than local scale and few ICDPs have tackled these larger issues. Berkes (2007) suggests more success has come from projects involving networks with multiple partners and especially when these interactions involve four or more levels of organization (e.g. local communities, regional government agencies, regional NGOs, national bodies, international groups, etc.). He also argues (p. 15191) that much 'of the so-called community-based conservation of the last 2 decades or so has been half-hearted, misdirected and theory-ignorant'. In short, some of the past problems with ICPDs have had less to do with the fundamental concept and more to do with the ways these projects have been carried out (Wilshusen et al. 2002; McShane and Wells 2004).

## **Reforestation to Enhance Livelihoods and to Foster Biodiversity Conservation**

Reforestation of degraded or under-utilized land outside the context of a single externally funded project such as an ICDP may offer more opportunities. Provided the type of reforestation used suits the particular circumstances of farmers there is

good reason to expect tree-growing can often improve farmer's livelihoods. It could do so by improving household assets, diversifying income sources and providing a cushion against economic shocks or other unexpected contingencies. In this sense, trees on farms are like bank deposits in places where there are no banks (Chambers and Leach 1989). Likewise, reforestation could provide significant conservation benefits. Most protected areas are too small to sustain all the species they contain and are not big enough to withstand the changes that global warming may bring. Reforestation of areas around and between protected areas could provide buffer zones at park margins, improving the connectivity between forest patches and allow population movement and genetic inter-change between separated populations. Reforestation could also help conserve biodiversity in areas outside the park network by sustaining those species still present in small forest remnants or enabling species to recolonize other remnants. And, perhaps most important of all, reforestation has the potential to eventually become a self-sustaining enterprise unrelated to the constraints of project cycles but driven by the self-interest of landholders.

Reforestation does have an opportunity cost and a shift away from growing food to growing trees might make some households more vulnerable to unexpected events. But not all farmland is equally productive and trees might be grown on less fertile or steeper areas of land less suited for growing food (Fig. 3.3). And, unlike many crops, trees require little labour once they are established. In short, the benefits of tree-growing may be significant while the spatial and temporal costs may be modest.



**Fig. 3.3** Plantations in Vietnam are often established on less fertile soils on hills while rice is grown in the more fertile valleys

Tree plantations currently account for 7% of global forest cover and are increasing at the rate of five million hectares each year (FAO 2010). Mayers (2006) argues that the overall environment for reforestation is currently improving because:

- Natural forests able to supply species favoured by the market are shrinking; many of the remaining forests have been over-cut in the first cutting cycle and will be unable to support another harvest in the immediate future. Countries that were once 'forest-rich' are becoming 'forest-poor'. The looming timber scarcity should also lead to higher financial returns from plantations.
- There are growing demands for forest products as populations and standards of living increase.
- There are technical and market developments that permit the use of smaller logs derived from plantations so that shorter rotations are possible. This should make tree-growing more financially attractive to smallholders. Note, however, that these developments might also mean small trees remaining in cut-over natural forests can also be marketed and this increases the risk that these forests will be prematurely logged a second time.
- There are increasing demands for the ecosystem services provided by forests such as carbon sequestration and watershed protection.
- There are opportunities for niche markets in a globalised world for higher-value, and hence more profitable, timbers.
- There is increased attention to and, possibly a reduction in, corruption and illegal logging in natural forests meaning forest growers can benefit more from tree growing.

It is usually assumed that the majority of reforestation is carried out by larger industrial groups or state forestry agencies. In fact smallholders play a much greater role than is generally appreciated. One 'rough estimate' suggested there were 500–1,000 million smallholders who grow trees on farms or manage remnant forests for subsistence and income (Scherr et al. 2004). A more quantitative estimate comes from the results from an international survey and reported by del Lungo et al. (2006) and Carle (2007). This showed smallholders are currently responsible for significantly more plantations than corporate or industrial groups. This was true at a global level (where smallholders had established 49.9 million hectares of plantations while corporate groups had around planted 27.2 million hectares of plantations) but was even more the case in Southeast Asia where smallholders have established 2.3 million hectares while corporate groups have established only 0.6 million hectares of plantations (Table 3.3). These data have to be qualified since neither Indonesia nor Myanmar recognised any corporate or smallholder plantations. Likewise, Thailand claims state ownership of all plantations except for rubber. And national data like this is almost certainly likely to underestimate a resource made up of small and scattered plantations. Nonetheless, the data point to a significant role being played by smallholders.

The conventional view is that large reforestation projects such as those carried out by government agencies and corporate groups are more successful than small-scale plantings. This is because of economies of scale and because governments and industrial plantation owners can afford more technically sophisticated management. This is not always true and many government sponsored planting across the region

**Table 3.3** The areas ( $\times 1,000$  ha) of productive plantation established by different owners in 2005 (Del Lungo et al. 2006)

	Public	Corporate	Smallholder	Other
Global	77,352	27,176	49,980	492
Southeast Asia	6,758	637	2,302	65
Indonesia	3,399	0	0	0
Malaysia	263	227	1,084	0
Myanmar	696	0	0	0
Philippines	186	43	75	0
Thailand	1,723	274	0	0
Vietnam	491	93	1,143	65

have failed (Chokkalingam et al. 2006; Nawir et al. 2007). And while well-managed government and corporate plantations can be very productive, the same can also be true of well-managed smallholder plantations. In addition, most of these are less likely to suffer from wildfires than are industrial plantations because owners can afford to look after their plantations on an almost tree-by-tree basis.

Of course these types of comparisons also depend on how ‘success’ is defined. In many cases timber productivity is only one of the measures that might be used. Mayers (2006) argues that with technical advice and with appropriate policy settings in place, small and medium forestry enterprises offer some considerable advantages to rural communities and households including spreading wealth more widely, empowering local communities and making greater commitments to operating in specific areas. The large overall area of smallholder planting activity also means that even small improvements in silviculture and productivity in farm plantations can have a very significant collective impact.

### *Types of Reforestation*

Reforestation is usually defined as the re-establishment of forests on sites deforested by human activities or natural disturbances within the last 50 years (Carle and Holmgren 2003). Many people equate reforestation with large industrial plantations of eucalypts or pines. But the options are much greater than this even if they are relatively unknown amongst many rural communities. As well as industrial plantations, there can be farm plantations, agroforestry plantings and various kinds of environmental or conservation plantings. In the present context reforestation is also taken to include forests that have regenerated naturally. Some of the features of these main types of reforestation are as follows:

#### **Plantations of Pulpwood and Commodity Grade Timbers**

Fast-growing pulpwood plantations are being established in many parts of the Asia-Pacific region. These are often grown for pulpwood using rotations of less than 10 years. By 2000 there were 14 companies in Indonesia alone with pulpwood plantations



exceeding 100,000 ha (Effendy and Hardono 2000). Across Asia as a whole these industrial plantations may now cover 4.5 million hectares (Mayers 2000). Most of these use only a single species drawn from exotic genera such as *Eucalyptus* or *Acacia* (Cossalter and Pye-Smith 2003). These species are chosen because their seed are easy to get, their timbers are known to be suitable for the pulpwood market and the silvicultural knowledge needed to grow these species in plantations has already been developed. As a result of tree-breeding some eucalypt plantations can now produce yields over of 40 m<sup>3</sup> ha<sup>-1</sup>year. Many more farmers would carry out reforestation if they were more familiar with the technology. Managers of National Parks would use more suitable forms of reforestation to rehabilitate degraded areas within their parks if they knew how to do so. How can existing knowledge be shared? How can it be communicated in a way that makes sense to the people who might use it?

In practice the average plantation usually achieves rather more modest yields than these and the productivity of some widely planted species found in a regional survey by ITTO are shown in Table 3.4. Though these yields are less than the levels reached in experimental plantings or in well-managed sites, they are still much greater than those produced by most natural forests.

While these types of plantation are clearly profitable for industrial groups their value to smaller growers depends on the plantation location and on the relationship these growers have with a market. Small farm plantations producing cheap timber and located some distance from markets are unlikely to be financially rewarding to a grower because the volumes they can produce are small, harvesting is infrequent and transport costs are high. To be successful these types of growers need to be part of a marketing cooperative or they need to develop a long-term arrangement with an industrial partner as outgrowers or in some form of joint venture. There are a number of examples where such arrangements have been made. Some have been very beneficial to growers while others have been exploitative relationships. Accounts of some recent experiences are provided by Mayers (2000); Mayers and Vermuelen (2002); Angelsen and Wunder (2003); Nawir et al. (2003) and Scherr et al. (2004).

Commodity grade timbers can be grown in monocultures but on longer rotations (20–30 years) to produce sawlogs. Species such as *Gmelina arborea* or *Pinus* spp. are often used for this purpose. Timbers of these species usually attract only modest prices which means that, like pulpwood plantations, these plantations are unlikely to be profitable unless growing close to a market. The profitability of different types of plantations will be discussed further in Chapter 9.

**Table 3.4** Average productivity in the Asia-Pacific region of some commonly used plantation genera based on survey commissioned by ITTO (STCP 2009)

Species	Productivity (m <sup>3</sup> ha <sup>-1</sup> year <sup>-1</sup> )
Eucalypts	15–20
Acacia	6–8
Pine	10–12
Teak	4–6
Rubber	10–15

The conservation value of both of these types of plantation is modest. Some critics have labelled them as ‘green deserts’. This is a little ungenerous since it depends on the plantation design and they can provide habitats for some wildlife and native plant species under appropriate circumstances. The Grand Perfect plantation estate in Sarawak, for example, plans to use less than half of its total area for plantation trees with the remainder being used for nature reserves, riverine strips, corridors and other purposes (Cyranoski 2007). A similar partitioning between plantations and natural forest is being developed at the Sabah Forest Industries plantations in north western Sabah where 62% of the 290,000 ha concession will remain as natural forest protecting steep slopes and riverine strips (Wooff 2009).

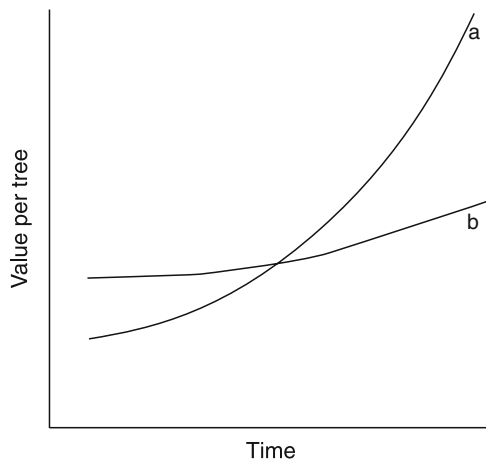
Any assessment of the relative merit of a particular plantation also depends upon what it replaces. Even a pulpwood plantation may offer some conservation benefits if it replaces a degraded grassland or impoverished shrubland. On the other hand, a plantation established by clearing undisturbed natural forest is another matter, especially when there is so much degraded land and forest across the region. One estimate suggests 15% of Southeast Asian pulpwood plantations have been established by replacing natural forest (Cossalter and Pye-Smith 2003) while Tynnela et al. (2003) suggest the comparable statistic for Indonesia is 22%. The situation becomes less clear when already degraded forests are cleared. How important are these for biodiversity conservation? Would they have been allowed to recover if plantations had not been established or would they have been converted to another land use such as oil palm? Under these circumstances the Grand Perfect and Sabah Forest Industries plantation designs seem a useful compromise because they guarantee large areas of secondary forest remain protected.

### **Plantations of High-Value Timbers Grown on Longer Rotations**

Plantations of ‘higher-value’ sawlog or plywood species grown on longer rotations of 30 years or more are less common because of the longer time periods needed to achieve a cash return and their generally lower productivities. But they offer the prospect of much higher prices than pulpwood timbers and have attracted attention from researchers and some state forestry agencies, particularly since supplies from natural forests have begun to diminish (Fig. 3.4). The term ‘high-value’ is a loaded term because all trees can be ‘high-value’ in certain circumstances. It is used here to refer to species able to produce specialty timbers or what are sometimes called ‘cabinet timbers’ and which have a high commercial price. Some of the more popular species include teak (*Tectona grandis*), rosewood (*Pterocarpus indicus*) and mahogany (*Swietenia macrophylla*) but a very large range of native species have been tested and used in state plantations across the Asia-Pacific region (Appanah and Weinland 1993; Do and Nguyen 2003; Erskine et al. 2005; Evans and Turnbull 2004; Krishnapillay 2002).

Some of these species have also been grown by smallholders and they can be especially attractive in more isolated locations where high transport costs make lower value timbers uneconomic. Thus in the Solomon Islands where transport is

**Fig. 3.4** High-value timber species (a) are less profitable than pulpwood species (b) in the short term but the value of each tree is likely to be considerably greater over time



expensive it is still profitable to market even a single shipping container of plantation timber provided it contains a high value timber such as teak (Raymond and Wooff 2006). The quality of timber in logs coming from smallholder plantations is likely to be less than that of logs from natural forests but the price advantage is considerable and there are silvicultural opportunities (e.g. via pruning and thinning) to improve log and timber quality over time.

These types of plantations offer some conservation advantages over short rotation pulpwood plantations because their longer rotations enable more structurally complex understories to develop. These advantages increase when native species are used in preference to exotic species. They are also likely to provide better watershed protection because the longer rotations mean disturbance occur less frequently and protective understories and litter layers are able to accumulate on the forest floor.

### Multi-Species Plantations of High-Value Species

Multi-species plantations or polycultures have not been greatly favoured by silviculturalists in the past because they are more difficult to establish and manage than monocultural plantations (Wormald 1992). On the other hand, these more complex designs have been widely used by farmers in the tropics in traditional agroforestry plantings because they increase the variety of goods produced and, at the same time, reduce the risk of total crop failure. A plantation mixture might include high value timber trees as well as multi-purpose tree species able to produce NTFPs. Although multi-species plantations are essentially versions of agroforestry plantings they have the potential to be more financially rewarding than most traditional agroforestry plantings. They may also have some financial advantages over simple plantation monocultures. For example, they might

include species or crops able to mature and be sold at an early age leaving slower growing and more valuable species to continue growing until they reach a marketable size. Mixed-species planting are likely to offer rather more biodiversity and functional benefits than the two types of monoculture plantations already described although the nature and magnitude of these benefits will depend on the species and plantation designs used.

### **Ecological Restoration or Environmental Plantings**

Some species-rich plantings are established to restore biodiversity and protect watersheds without there being any intention of a harvesting operation some time in the future. Tree felling is not normally allowed in such forests. This, together with their comparatively high establishment cost suggests such plantings are more likely to be used by government agencies and NGOs to reforest small strategic locations than by poor farmers. But some communities undertake these types of plantings for religious and subsistence reasons and Box 3.1 describes such a case in northern Thailand. The conservation advantages of these types of plantings can be very high most especially when they attract seed-dispersing birds which bring in other species to supplement those that were planted.

### **Natural Regeneration**

Sometimes forests are able to regenerate at degraded sites such as former farmlands if they are protected from further disturbances. These forests can vary enormously in composition and value (both for subsistence and for commercial purposes). Some may be rich in species and have large numbers of rapidly growing timber trees or high densities of NTFP species. Others may have relatively few of these species but can be enriched with them. There are many examples across the Asia-Pacific region of such agroforests enriched with species able to produce NTFP (Clarke and Thaman 1993; Michon 2005). There are also many examples where heavily logged forests have been enriched with timber trees (Dawkins and Philip 1998). Properly managed, these forests can have benefits for both livelihoods and biodiversity.

Each of these reforestation alternatives differs in their capacity to improve human livelihoods and conserve biodiversity and these differences are summarized in Table 3.5. The most promising approaches that contribute to both objectives are those involving natural regeneration or native species grown in plantation mixtures while pulpwood monocultures and restoration plantings are the least attractive (although they may be highly suited for just timber production or just biodiversity conservation). All of these options are open to smallholders or communities although they are most likely to be attractive in regulatory environments with low costs of entry and operation, limited numbers of regulations, few subsidies to large industrial groups (including loggers) and secure forest rights (Scherr et al. 2004).

**Box 3.1 Forest Restoration in Northern Thailand by Villagers Lacking Formal Land Tenure**

Many communities living in deforested areas are interested in establishing multi-species forests near their villages. An example is the forest established by villagers of Jabusee village near the town of Mae Salong in the Province of Chiang Rai in northern Thailand. The 30 households are all Akha people who probably settled there in the 1970s and now grow corn and raise livestock. When they first arrived the area was highly degraded and covered by *Imperata* grasslands even though it is supposedly part of the national forest estate administered by the Royal Forestry Department. This deforestation had probably resulted from shifting cultivation carried out by earlier inhabitants. With the help of an NGO, the Hill Areas Development Foundation, the community reforested about 10 ha of this land using a variety of tree species including many native species. Some of this was done by planting seedlings and some by natural regeneration. The outcome has been the creation of a species-rich forest with a closed canopy growing close to the village. Most of this forest is now more than 10 years old and is able to supply a variety of NTFPs. These are utilized by households according to a set of specified conditions. The village has also developed an eco-tourism business based around the forest. Being on a ridgetop the site was probably not very good for cropping but there appear to be several other reasons for undertaking this particular form of reforestation. One is that such forests are part of the Akha religious tradition and are used to protect sacred areas. But another may be that villagers knew that the government classes the area as an important watershed and hoped that the reforestation they have carried out will eventually assist them in their search for formal land tenure and Thai citizenship. An account of the biological diversity in another newly created village forest not far from Jabusee village is given in Box 5.2.

***Some Qualifications***

There are several qualifications that need to be made about these four alternatives.

**Environmental Conditions Will Constrain Silvicultural Choices**

The more degraded a site, the fewer the choices. Perhaps only a handful of exotic species will be able to grow at highly degraded sites. In these cases it may be possible to grow monocultures of timber trees but the ability to restore much of the original biodiversity may be limited (although it may be possible to improve ecological processes and functioning). In such situations a multi-step process may be needed with more native species introduced at a later stage once environmental

**Table 3.5** Forms of reforestation that overcome degradation and improve conservation values

		Overcome degradation and improved conservation values	
		More beneficial	Less beneficial
Capacity to improve livelihoods	Higher	Natural regeneration and enriched secondary forests Mixed species plantations of mostly high-value species grown on long rotations Monoculture plantations of high-value native species (timber or multi-purpose) grown on long rotations	Monoculture plantations of fast growing exotic species grown on short rotations (especially if close to markets and/or private growers have a long-term and mutually beneficial contracts with industry)
	Lower	Restoration plantings for strictly biodiversity purposes	Company owned plantations established at the expense of existing land owners Farmer owned plantation established but failing because of inappropriate species choices, management methods, pests, disease or wildfire

conditions have been ameliorated by the exotics. Some silvicultural options for dealing with this issue are discussed further in Chapter 7.

### Not All Smallholders May Be Willing or Able to Engage in Reforestation

Not everyone may be interested in timber tree planting. Those without land tenure are unlikely to do so because of the risk they will not be present to benefit when the trees mature. And of those with tenure, the poorest farmers may not engage in reforestation because they need all the land they have to produce food or they do not have enough money to pay the initial planting costs. For them the opportunity costs of any kind of reforestation may simply be too high (although agroforestry may be attractive – see further below). Poverty alleviation for such people may require land



redistribution, off-farm employment or some kind of social protection. Other people with land may not be able to participate in reforestation because they don't have, or are unlikely to get, road access to enable them to harvest and market their logs. This is because even small-sized logs need tracks that small trucks or tractors can pass over. Some of the factors influencing landowner's decisions about tree planting are discussed in Chapter 10.

### **The Most Appropriate Silvicultural Systems Are Complex and Many Are Still Being Developed**

Plantation monocultures such as those used to produce pulpwood are relatively simple to establish and manage. However, the types of reforestation able to deliver both livelihood and conservation benefits must be rather more complex. It is because of this that they are rather less attractive to most large industrial growers. On the other hand, this complexity is not necessarily an impediment to smaller growers who are interested in 'quality' as well as 'quantity' and in creating forests generating a variety of goods. The wealth of agroforestry practices already being used provide a starting point for those interested in developing these multi-purpose plantation designs (Michon 2005). The issue is discussed further in Chapter 4.

### **These Options May Vary with Time**

The difference between the four cells in Table 3.5 may not be as definite as they seem. Circumstances may change during the life of a plantation and make it less or more profitable than expected. For example, markets for cheap pulpwood timbers may decline because of oversupply while the price of higher value timbers may rise as the supplies from natural forests decrease. Similarly, a restoration planting established largely for biodiversity restoration (a potential win-lose situation) may also generate livelihood benefits because of the NTFPs they produce or the development of eco-tourism thereby becoming a win-win situation.

### **There May Be Other Silvicultural Options**

The several alternatives described here do not adequately represent the full range of silvicultural options that could be available. For example, plantations differ in whether native or exotic species are planted or in the lengths of the rotations used, but they also differ in the types of trees planted (timber trees, wildlife attracting species or multi-purpose species able to supply various NTFPs) and whether they are also planted with non-tree species such as food crops or medicinal plants in a system perhaps better described as agroforestry. Different species and different

planting designs will have different consequences for the way these ecosystem function and the ecological processes they are able to sustain. All these variables affect both the conservation benefits arising out of reforestation as well as the contribution reforestation can make to improving livelihoods. These options will be discussed in more detail in later chapters.

Of course not all options will be available in every ecological or social circumstance and the variety of choices is likely to be greater in, say, a humid location with a low population density than in a seasonally dry area with a dense population.

### **There Must Be Trade-Offs Between Production and Biodiversity Conservation**

Finally, it is important to acknowledge that plantations designed to conserve biodiversity as well as generate cash incomes run the risk of doing neither particularly well. This means trade-offs will be needed. These may be easier for smallholders to make than large industrial plantation growers since many smallholders will be growing trees for reasons other than simply maximising timber production. For example, they may be concerned with reducing financial risks by using several species and prefer to use trees that produce fruit as well as timber.

There is also a scale issue involved. Not all trade-offs must be made at every site since landscapes are not uniform and biodiversity ‘hotspots’ and poverty ‘hotspots’ may not necessarily overlap. This means trade-offs may be easier to make at a landscape scale and the type of intervention made at particular locations may depend on the context such as population densities, market access, opportunity costs of alternative land uses or the amount of remnant forest still present. These landscape issues will be discussed further in Chapter 11. But trade-offs cannot always be made and there may be some situations where it is not possible to use market mechanisms alone to achieve the required conservation outcomes. In such cases special payments will be needed to compensate growers for doing so (‘if biodiversity cannot pay then biodiversity must be paid for’).

In short, Westoby may have been right in his original 1962 hypothesis that under the right conditions, forestry – but in this case plantation forestry – should have a beneficial role to play in rural development even if it cannot solve all livelihood problems (Westoby 1987). And, at the same time, at least some forms of reforestation should also be able to improve conservation outcomes on degraded lands even if these outcomes may take some years to appear. However, as already noted, the fact that one or other forms of reforestation may have some potentially useful contributions to make to rural development does not necessarily mean any of these they will be taken up by landholders. As past experience with ICDPs has shown, there are a host of factors other than technological factors that influence such choices. One of the most important of these factors is the system of land tenure.

## The Role of Land Tenure

Tenure refers to a right of access to land and the use of the resources found on this land. There are many forms of tenure but these usually determine the individuals or communities who can use various resources, the conditions under which they can do so and the lengths of time that they can have control (FAO 2002). Thus rights might involve the rights to use land, the right to derive an income from the land and the right to lease or sell that land. Some farmers have legal title to the land they are using while others live in a more ambiguous situation where they only have *de facto* tenure based on the fact that their claim is recognized by the community in which they live but not by the government.

Patterns of land tenure vary across the region and are currently undergoing significant changes in many countries. In reviewing the relationship between land tenure and reforestation it is useful to begin by examining traditional forms of tenure. In traditional societies quite complex systems usually developed linking individual tenurial rights and communal obligations (Cleary and Eaton 1996; Crocombe 1982; Eaton 2005). These various systems often shared certain characteristics. One was that a person's rights were usually acquired through membership of a particular clan, lineage or group. Within this group, rights could be allocated and transferred according to traditional practices. Decisions could be made by the group as a whole or by chiefs or other community leaders. Rules usually regulated who had access to the group's forest or land and, in some cases, how these resources might be managed. Some people had usufruct rights (i.e. to enter a site and use the products growing there) or control rights (i.e. to plant crops or trees or to control who else uses the site). Sometimes systems differentiated between the rights of a landowner and the rights of someone who has planted a tree on that land. In some cases the act of clearing land or planting a tree was seen as conferring 'ownership' of that land on the planter.

These rights could last for years or might lapse if not maintained by regular visits. For example, Freeman (1955) noted the rights of Iban farmers in Borneo often lapsed about 7 years after a garden has been abandoned. In Papua New Guinea in the 1970s it was noticeable that most male university students living in the capital, Port Moresby still took care to periodically visit their often distant home villages to maintain their usufruct rights. Byron (2001) quotes an extreme example of the sometimes complex nature of customary tenure. This involved a single mango tree in Bangladesh over which seven families had tenurial claims. These included the family who had planted it, the current and previous owners, the family engaged in marketing the fruit and the local sawmiller who had a 'lien' over the tree once it was ready for felling. Despite this complexity the system worked although, as Byron wryly notes, any breakdown would almost certainly lead to the demise of the tree.

A second characteristic of many customary tenurial systems is that household land holdings are flexible and can vary over time. Few customarily owned lands have formally recorded clan boundaries or individual holdings and most boundaries were defined by natural features such as rivers or ridge lines. This often led to

disputes over ownership which sometimes led to warfare and changes in land ownership. However, most customary systems were also flexible and allowed some transferring of use or ownership between members of different groups. These mechanisms included gifts, exchanges or the adoption of children. Land ownership patterns within groups were normally adjusted by re-distribution after death and the factors determining how this was done included gender (of both the transferee and heir), age, seniority of birth and personal standing (Crocombe 1982).

These basic arrangements could be overlain by more complicated local arrangements. For example, kings, sultans and other local rulers in Asia often claimed sovereignty over certain lands (mostly coastal lowlands and river flood-plains rather than the hills). In practice, villagers usually claimed rights to actually use the lands and worked out amongst themselves how these resources might best be distributed in order to serve the interests of individuals, families and the state. Such arrangements were established in customary law and practice and were strongly defended against external challenges (Chandler et al. (1987). In the Pacific, and especially Polynesia, royal families and noblemen also claimed certain special privileges over land ownership and use.

Many of these traditional systems have either changed or are changing and the present patterns of rural land ownership across the Asia-Pacific region now include traditional practices derived from customary and feudal societies as well as those developed during the colonial period and from more recent political systems. In most Asian countries the state has usually asserted its rights to own or manage the ownership of much of the land within its boundaries. As a consequence, land has often been compulsorily taken from customary owners when it suited the State's purposes. Some has subsequently re-allocated to others, including foreigners, through a system of freehold purchases, grants or leases. The process has been described by Jacoby (1961); Chandler et al. (1987); Cleary and Eaton (1996); Sato (2000) and Eaton (2005).

This assertion of state ownership of land in Asia has meant that customary owners have often become squatters on their own land. The areas involved and numbers of people affected by this transfer of ownership are very large. For example, Li (2002) quotes estimates of 60% of the national territory of the Philippines and 75% of Indonesia were taken over in this way. In the case of the Philippines, the land in question was home to about 24 million people or one third of the country's population. Being officially landless these people became subject to eviction or displacement if confronted by new large-scale agricultural projects or other state-sponsored enterprises. Unsurprisingly, this has sometimes led to conflict. In Sarawak, logging operations in the newly claimed state forests and forced resettlements have prompted many protests. These have been widely publicized (Colchester 1993; Dauvergne 2001). The Sarawak state government argued it was bringing economic growth to the province and that all citizens would benefit. The customary owners responded by erecting barricades to prevent the takeover of their ancestral lands by what they saw as an urban elite.

Sometimes government sponsored changes have led to conflict between different ethnic groups. This occurred in Central Kalimantan where a national government transmigration program had brought in large numbers of people from the island of

Madura (near Java). They were granted legal rights to land traditionally owned by Dayaks. The migrants were seen by local Dayak people to not only represent the state's monopoly over land but also to show insufficient regard for local laws and prerogatives. The uneasy relationships between the two groups eventually led to a series of riots with an especially serious disturbance occurring in 2001 when 500 Madurese were killed and 150,000 were forced to leave the area (Bouvier and Smith 2006). The Dayaks believed the migrants were taking over 'their' province with state support while the Madurese believed the Dayaks wanted their farms and jobs.

These conflicts over land use and tenure are often made more difficult to resolve because the responsibility for land is sometimes spread across several government departments or agencies (agriculture, mining, forestry, the military). This leads to overlapping functions and a plethora of often conflicting legislation (Sato 2000). Not all of these agencies have the will, let alone the capacity, to enforce the various laws. Further, many of these agencies are in competition with one another. For example, forestry departments are usually supposed to be the agencies administering national forest estates and protecting watersheds. But once the great logging boom of the 1960–1990 period began to wind down, many agricultural departments began looking at these logged-over forests as places to settle landless people, establish oil palm plantations or implement other agricultural schemes, thereby fostering national 'development'. This potential loss of control was resisted by forestry agencies who had expected to continue controlling and managing the forests recovering after logging. Unfortunately for them, agricultural crops are usually more profitable than timber production, especially in heavily logged forest and large areas of former forest land have been converted into plantation crops such as oil palm, especially in Malaysia and Indonesia.

These inter-agency rivalries have mostly left customary owners in limbo (although a number are probably unaware of their changed legal circumstance). Not that this troubled many government agencies. In fact it probably suited most of them. As Li (2002) observed, if a forestry department acknowledges that there are millions of people living in 'state forests' they must then also acknowledge that they are not really in control and cannot implement their own laws. Over time, the response of customary owners and more recent migrants has been to seek opportunities to realign their relationship with the state system using whichever agency seemed appropriate. Their primary purpose in doing this has been to consolidate or secure their hold over the lands they are using.

## Land Tenure and Reforestation

The importance of the role of land tenure in fostering reforestation is widely recognized (Byron 2001; Chokkalingam et al. 2006; Enters et al. 2003; Mercer and Soussan 1992; Sanchez 1995). In the absence of some form of tenure most farmers will be hesitant about making an investment from which they may not receive any return. Plantations with long rotations are especially risky. This means that national reforestation schemes or joint ventures between smallholders and private timber companies are

unlikely to succeed unless households have some kind of formal and legally enforceable form of land ownership or tenure including the rights to harvest forest products such as timber. Unless this is the case the only rational course of action for a farmer would be to make short-term investments and engage in opportunistic and possibly exploitative behaviour. Vietnam has recently embarked on a large-scale process of land allocation including allocating land specifically for reforestation (Box 3.2). The program appears to have helped increase forest cover although it has been clear from this experience that tenure alone is not sufficient to foster tree-growing.

The importance of tenure for plantation forestry might seem self-evident so it is interesting to find examples of reforestation that have been carried out by small-holders without formal legal tenure. Many of these cases involve some form of enrichment planting of state-owned forests by local communities who regard themselves as the traditional owners. Examples include the damar (or resin) forests of Sumatra (Michon 2005), the jungle rubber systems of Sumatra and Borneo (Schroth et al. 2004), the mixed fruit and timber forests of West Kalimantan (de Jong 2002) and the 'tea' forests of northern Thailand (Sasaki et al. 2007). But other cases involve farmers who have reforested degraded lands over which they have no formal title such as those in the uplands of northern Luzon in the Philippines (Schuren and Snelder 2008).

At first these plantings seem paradoxical. Why should someone invest time and resources in planting trees without any assurance they will be able to benefit by harvesting the products it produces? One of the answers is that these farmers perceive the risk of dispossession as being low even though they do not have legal tenure. From their point of view the most significant thing is that their ownership is widely recognized within their community. Recent events in the damar forests of southern Sumatra are illustrative of the situation. These complex and species-rich forests have been created in south west Sumatra over the last 100 years. Their purpose is to produce damar from the dipterocarp *Shorea javanica* and they have attracted the attention of researchers because of their biological diversity and importance to local communities (Kusters et al. 2007; Michon 2005). Their location and the resources they contain meant they also began to attract the attention of loggers and people who wanted to convert the area into oil palm plantation. In 1998, as a result of lobbying by NGOs and scientists, the Government of Indonesia agreed to prevent these outside interventions and enable the customary owners to register to acquire concession rights over the forests. This would not grant formal land ownership but would guarantee the villagers rights to management and benefit from the forests they had created. The agreement was regarded by outside observers as something of a breakthrough in reconciling the disjunction between de facto and de jure land ownership in Indonesia.

However, the farmers thought otherwise. By 2005 not one application for registration had been lodged. From the farmer's point of view they would be acknowledging the legitimacy of the government's claim of ownership of their land if they signed. They might have security but it would be at the expense of their traditional rights. Besides, the offer itself had recognized the primacy of the traditional owner's usage and people believed this alone had been sufficient to prevent outsiders moving in. In short, farmers felt empowered that their rights



**Box 3.2 Land Tenure and Reforestation by Smallholders in Vietnam**

After a period of collectivized agriculture Vietnam has begun allocating land to households for farming and reforestation. The amounts of land are relatively small and average less than 5 ha per household. Certificates, known as ‘Red Books’ are issued giving legal rights to land for up to 50 years. The reforms have led to significant improvements in agricultural productivity and a major reduction in rural poverty. The changes also have a reforestation component and degraded land unsuited to cropping is also being allocated to households on long leases for tree planting. Areas of up to 30 ha per household are being allocated depending on location. In addition, farmers living near natural forests are being offered contracts to earn money by protecting and managing these.

Significant reforestation (via natural regeneration and plantations) has occurred since these changes with the national cover increasing from around 25% in the 1980s to 35% by 2002 (Meyfroidt and Lambin 2008). However the results have been uneven and have varied with location. Sunderlin and Huynh (2005) describe positive as well as negative assessments of the impact of the land allocation process on reforestation. Perhaps the key issue is that a farmer’s decision on whether or not to plant trees depends on factors other than just land tenure. These other factors include the need by many farmers to first establish food security. As well there are the opportunity costs of tree-planting, the need for technical knowledge about species and silvicultural methods, the availability of capital, the perception of markets for forest products and the availability of transport to bring forest products to markets. In some places none of these problems were especially significant and the granting of tenure soon prompted tree-planting. But in others it did not or farmers were more cautious about what, for many, was a new land use activity (Castella et al. 2002; Sikor 2001).

The process of forest land allocation has been difficult to implement and is still on-going. One problem has been the difficulty in developing rapid and robust means of carrying out participatory land use planning prior to land allocation. Another has been the challenge in changing the culture of forestry authorities from one that emphasized control over forested lands to one emphasizing facilitation and partnership with local communities or individual households (Nguyen and Gilmour 2000). Sunderlin and Huynh (2005) also point to a number of other problems including the frequent incompatibility of the changes to local livelihood practices, the fact that many sites were badly degraded (and so are hard to reforest) and that policies are often altered. In short, land tenure is an important precursor to reforestation but must be accompanied by other policies relevant to the people whom are to carry it out if it is to trigger reforestation.

had been recognized and believed these were now relatively secure enough even though a process that would have granted them legal rights was never completed (Kusters et al. 2007).

The perception of tenurial security by these farmers is necessarily subjective. Kusters et al. (2007) suggest it is affected by the existence of external threats, the extent to which people are aware of their actual legal status, the degree of external support received by the community and the role of local officials who may be sympathetic or hostile to their cause. People facing few threats or those with sympathetic and powerful allies are more likely to be optimistic about their opportunities and be prepared to take a longer-term view than those without these advantages. Of course the reverse is also true and Byron (2001) describes an interesting case in Vietnam before the Doi Moi reforms in 1989 where farmers had been given tenure documents but behaved as if they had no tenure because they feared the government would one day renounce these documents and re-appropriate any new forests that had been established. Finally, the case from northern Thailand described in Box 3.1 shows how reforestation by recent migrants might also be carried out as a means of demonstrating good citizenship. By planting trees farmers believed they would be able to eventually acquire land tenure and citizenship.

These examples do not imply that tenure is unimportant; legal certainty is always preferable to tacit or implied agreements and reforestation is always likely to be more attractive for farmers owning land than those without some form of tenure. However, the lack of formal ownership need not imply that any kind of reforestation is impossible.

## **Community Forestry**

There are several ways in which rural communities might undertake reforestation of areas outside protected areas. One is by the community as a whole doing it and the other way is through the action of individual households. In discussing the possible role of communities it is useful to first consider how they have begun to play an increased role in the management of natural forests.

### ***Community Forestry Within Existing Natural Forests***

The historical record outlined in earlier chapters suggests that, with some exceptions, most government agencies charged with managing forests have not been particularly successful. They have neither protected them nor addressed the needs of communities living in or around them. This has prompted some governments to devolve responsibility for protecting and managing the remaining forests to local communities. In most cases these have been secondary forests regenerating after logging but some cases have included primary forests. In return, these communities have been allowed a greater share of the benefits of harvesting resources from the forests. This change has several potential advantages. Firstly, those living in or near the forests are likely to be more successful in protecting them for the national benefit than government agents commuting from a district headquarters. Secondly, livelihoods are likely to be improved because the benefits of harvesting are shared

more equitably than in the past when most benefits were captured by an urban elite. And, thirdly, the process can sometimes take advantage of traditional methods of natural resource management to create robust management systems which are in everyone's interest to maintain.

The approach has become known as community forestry. Fisher (2003) defines this as 'some element of community participation in forest management and some commitment to improved or secure provision of at least some forest products to rural people living in and near forests'. The effect of these changes has been to turn people previously regarded as squatters or illegal collectors of NTFPs into legitimate forest managers. Community forestry is now part of the forestry dialogue throughout the region and most (though not all) countries have some kind of policy framework and have explored the idea through various approaches (Hobley 1996; Lynch and Talbot 1995; Poffenberger 1990; RECOFTC and FAO 2003; Shackelton et al. 2002; Victor et al. 1997).

In practice the process of devolution has taken several forms. One approach involves the government forestry agency offering contracts to communities or households to protect a defined area of existing state forest for a certain time. As well as receiving a cash payment, participants may also be offered the rights to harvest timber or NTFPs under prescribed conditions. This may not be sufficient for those households with no other land (Fig. 3.5). Another version allocates these



**Fig. 3.5** Natural forest on a hillside in southern Vietnam is gradually being converted to orchards by poor farmers even though this is supposedly a Protection Forest and they have contracts to protect it. Each household in this particular area has an average of 0.8 ha of forest to protect. Their dilemma is that they have little other land from which to make a living

forest lands to the community or household on a long-term lease (e.g. 20–30 years with the possibility of renewal). Again, the community is responsible for protecting the forest but is granted the right to harvest timbers and NTFPs under agreed conditions. In both cases the government retains land ownership and prescribes the conditions that the community or household must fulfill not least of which is that they must maintain the area as forest and not clear the land and use it for agriculture. The full transfer of ownership is also being explored in some countries although the state usually retains ownership of the higher quality forests (Castella et al. 2002; Cornista and Escueta 1990; Lynch and Talbot 1995; Penafiel 1996; Scherr et al. 2004; Sunderlin et al. 2005).

The methods communities use to manage these forests also vary but usually involve some kind of supervisory committee. This body decides who shall have access to the forest's resources and the rates at which these resources shall be harvested. The committee usually establishes penalties for those who break these rules.

The situation is different in the Pacific because people have always had full legal ownership of their forests. In the past governments usually took it upon themselves to manage these forests on behalf of the owners which usually meant simply allocating logging concessions to overseas companies. There have been some recent examples, however, of local communities managing their own forests for commercial purposes. Most of these involve using small portable sawmills which enable communities to sell timber and not just logs (Filer and Sekhran 1998; McGrath 1998). These community management systems have had some modest successes but have not reached the stage where they have supplanted overseas logging companies. In fact they are often seen as being complementary with rather than an alternative to large-scale logging. Filer and Sekhran (1998) describe some of the complex history of forest exploitation and community forestry in Papua New Guinea and the relationships between landowners, government, NGOs and donors. They suggest Papua New Guinean landowners are gradually learning that they cannot rely on other stakeholders for solutions and, through a process of learning-by-doing, are gradually moving towards a stage of being more self-reliant.

While some of these community forestry programs are already yielding promising outcomes others have failed. A number of problems frequently occur.

1. *Decision-making and governance*: many government forestry agencies have been reluctant to pass on authority for decision-making and management to communities believing that they cannot have the technical capacity to succeed. This is especially the case in countries where all forest land is regarded as being State Forest. This has meant that much community forestry is often still a top-down process with key decisions still being made by government staff.
2. *Agreements*: there is a need to finalize agreements between the government and other stakeholders that define the rights and responsibilities of each party. It is often difficult to do this since there can be a substantial difference in the expectations of governments and people over just what community forestry is about and what it can deliver. Sometimes communities can be trapped in one-sided

collaborative agreements that force them to take on a large share of the responsibility while getting little benefit.

3. *Equity*: communities are not necessarily homogenous entities and sometimes wealthy or politically powerful individuals can control decision-making or commandeer a disproportionate share of the benefits arising from the devolution process (e.g. they acquire all the better quality forest or land located nearest the road network). If some equity is to be achieved there must be some kind of supervisory committee whose role and membership is accepted by the community.
4. *Legal back-up*: local institutions and agreements often need to be supported by some form of legal authority so that the parties are held accountable and there may be a need to control outsiders such as local entrepreneurs or loggers who may ignore rules established by the community and continue to act outside any agreement.
5. *Stability*: most countries have had difficulty in implementing community forestry because government policies keep changing. Hence many people – including forestry department field staff – are often unaware of current policies. This means national laws or policies may not be implemented at a district level.
6. *Technical and market knowledge*: many communities have a limited understanding of the species and silvicultural options available to them. Similarly they may have an incomplete knowledge of markets and marketing so that they can not receive the full financial benefits potentially available to them.
7. *The forest area is too small or too distant from the community to be worth managing*: small patches of forest may not be large enough for people to make a living from NTFPs alone. Unless the forest can be enriched in some way there is a risk it will be gradually converted to agriculture or abandoned (Fig. 3.5). People allocated more distant patches of forest may find it is simply not worth the effort involved in travelling to them.

Fisher (2003) is of the opinion that there has been a systematic tendency to exaggerate the contribution that community forestry has made, so far, to livelihoods although there may have been some improvements in forest condition. Community forestry will of necessity be an evolving process where participants, including government agencies learn, adapt and develop local institutions to suit their circumstances.

### ***Community Forestry on Cleared or Degraded Lands***

To date most community forestry has involved managing natural forests regenerating after disturbances. The process is relatively passive and involves protecting the regenerating trees from disturbances and establishing rules concerning access and harvesting rights. There are cases where the community has reforested cleared lands for subsistence or religious reasons (e.g. Box 3.1) but it appears rather less common for communities to undertake the reforestation of cleared or degraded lands for largely commercial purposes. Where this has happened most early approaches were simply contractual arrangements in which a landowner

(usually the government) initiated the process, paid the community to reforest a prescribed area and provided them with the seedlings to do so. Many of these plantings subsequently failed because the community was not concerned whether the plants survived or not and had no interest in follow-up maintenance.

A more promising approach has been to develop joint ventures between the community and government or a private company using lands granted to or leased by the community. In these cases both parties receive a share of the financial benefits so there is more of an incentive for the community to ensure the planting is a success. An alternative version of this model operates in Papua New Guinea where land owned by the villagers is leased to the reforestation company and both parties share in the profits (Hunt 2002).

The simplest approach to involving communities in reforestation involves granting communities either full ownership or a long lease over land and assisting them to reforest these areas. The communities then retain all the eventual financial benefits generated by the new forest (Peluso et al. 1990; Penafiel 1996; Pragtong and Thomas 1990). A significant community-based program has developed in the Philippines using this approach to reforest degraded lands and Poffenberger (2006) estimates that agreement agreements of this kind now cover around 37% of forest land in the country. The program is not without problems but appears to be more successful than much of the reforestation carried out directly by government agencies (Box 3.3).

Another apparently successful community reforestation scheme was that carried out in north eastern Thailand and described by Hafner (1995). The area is one with

### **Box 3.3** Community Forestry in the Philippines

There has been a long history of attempting reforestation in the Philippines. Most of the early attempts were carried out by government agencies or by logging concession holders (as part of their concession obligations). Many of the early reforestation projects necessitated evicting upland farmers from their lands or simply using them as labourers (Chokkalingam et al. 2006). The planning was top-down and success rates were modest, especially when payments for contract planting were delayed. Some of the plantations were subject to continual degrading pressures such as fires and illegal harvesting.

Since the late 1980s there has been a strong shift away from government reforestation towards community-based reforestation. The number of programs has been large (Harrison et al. 2004) and the plethora of programs and policies, the frequency of changes and the inconsistencies between various policies have led to a good deal of uncertainty amongst government field staff as well as communities over just what the policy conditions are. The two most recent national programs have been the Community-Based Forest Management Program (1995) and the Community-Based Resource Management Program (1998). Both have involved

(continued)



**Box 3.3** (continued)

a number of distinct sub-programs all of which were aimed at communities and it is likely that most of the tree-planting carried out in the Philippines between 1996 and 2002 was accomplished through these two programs. The programs have sought to ensure the sustainable development of the national forest resources, reduce rural poverty and overcome environmental degradation. They have mostly followed a deliberate and participatory planning process in which communities were involved. Communities have been given leasehold land (initially 25 years but renewable for a further 25 years) although the government has retained effective control over the timing and manner of timber harvesting (Harrison et al. 2004; Chokkalingam et al. 2006). Such tenure rights are conditional and the government cancelled a number of agreements in 2006 following reports of some logging violations (Chokkalingam et al. 2006).

These two programs were heavily dependent on outside funding and community enthusiasm appears to have declined, at least in some areas, as these external funds have dried up. There may be several reasons for this. One may be that tree growing is perceived as being financially unattractive without such subsidies and continued technical and marketing support is needed until profitability can be demonstrated. Another is that there are often significant constraints placed on the rights of communities to sell the trees they have planted even though they may have secure tenure over their land. Felling permits are required that often involve a lengthy bureaucratic process and these can be affected by unclear harvesting policies for watersheds and the frequent suspensions of harvesting rights in response to environmental and political crises. Finally, there is evidence that some farmers, especially migrants in non-traditional communities, prefer to grow trees on land of their own rather than as part of a more cumbersome community effort provided they can acquire appropriate land tenure (S. Harrison: pers. comm.).

Chokkalingam et al. (2006) carried out an assessment of recent forest rehabilitation in the Philippines and concluded these community-oriented programs had the potential to produce rather better outcomes than the plantings carried out by state forestry agencies, NGOs or private sector initiatives. Many of the latter were destroyed or failed (for largely social, institutional or financial rather than technical reasons). The community-based plantings also appeared to have achieved some rather better, though still modest, biodiversity conservation benefits.

high levels of rural poverty, significant population pressures and a forest cover of less than 5%. The NGO-sponsored project operated over 10 years and created 165 ha of plantations and involved 89 villages. It had four phases. The first was an organizational and implementation phase where the focus was on gaining community support and commitment to the idea of establishing community woodlots on common land. Interested volunteers were sought to form a Community Forestry Committee and this group chose the initial species to plant and arranged the land to

be planted together with the necessary labour to do so. In this early stage community involvement was encouraged by developing a festival-like atmosphere in which food and entertainment were used to reward participants. The second phase was concerned with sustaining interest in the project once the trees had been established. This was done by encouraging intercropping with food plants to generate short-term income and by providing information on agroforestry techniques. The third phase dealt with managing the first harvest (after about 5 years) and sharing the funds generated to individual farmers and for village projects. This was carried out with the use of a revolving fund. The final phase was one in the sites are being replanted using a more diversified group of tree species and attempts are being made to increase the levels of tree planting throughout the community without the need for external support. The apparent success of the project has been due

**Box 3.4** Community Reforestation on New Georgia Island, Solomon Islands

Most of the logged-over land in the Solomon Islands has been left to recover through natural regeneration and only small areas of plantation have been established by the government or private companies. This is largely because the difficulty in acquiring land from traditional owners. Most of the existing plantations were established during the colonial era and the Solomon Islands government subsequently sold these to overseas corporate owners after independence in 1978. However an unusual community-owned plantation has been established by the Ngrassi, Dukerna and Lunga people living on the northern coast of New Georgia Island in the Western province. The project was initiated by the influential and charismatic leader of the local Christian Fellowship Church who persuaded the community to pool the funds received from logging in the community's forests instead of distributing them among individual clan members (Hviding and Bayliss-Smith 2000). The project commenced in October 1999 with the building of a nursery. Since then over 1,000 ha of plantations have been established using mainly *Eucalyptus deglupta*, *E. tereticornis*, *Gmelina arborea* and *Acacia mangium*. Some technical support came from an NGO (the Rural Development Trust Board) who helped develop the nursery and get seed. The trees have grown well and the main problem now lies in marketing the timbers. The island of New Georgia lies off the main shipping routes and it may be difficult to find buyers for comparatively small volumes of logs. On the other hand, the community might be able to form a relationship with the company that now owns some the former government and now company-owned plantations on nearby (ca. 10 km) Kolombangara Island. Similar species are being grown there and are being sold to Japan, Indonesia, Korea and Vietnam. The success of this community project undoubtedly lies in the strong community structures created by the church and its leaders. It remains to be seen whether similar community tree-planting programs can be developed elsewhere in the Solomon Islands. There is evidence that many people in other villages favour individually owned plantations.

to the level of local participation, a flexible operational strategy and an emphasis on building local capacities so future plantings can be managed without external support. In this case it is assumed that the initial group-centred approach will eventually be replaced by individual household tree-planting projects.

Finally, an intriguing form of community-based reforestation is currently underway in the Solomon Islands on land fully-owned by the community (Box 3.4). This is a close-knit traditional community with strong leadership and a clear idea of what it hopes to achieve through reforestation. The importance of the latter point is illustrated by the more disappointing experience of a community living near Port Moresby in Papua New Guinea. This community acquired a well-established teak plantation covering 1,500 ha that had been previously owned by the government's Forestry Department. In the late 1970s the Department was forced to hand over the land and trees after a court ruled it had mistakenly purchased the land from people who were not the legal owners. This is rare example of alienated land being re-customized. But, rather than manage the asset, the new owners gradually let it be (prematurely) felled and within a comparatively short time the plantation had disappeared. In this case it seems the community had neither the leadership nor the internal management structures necessary to maintain what could have been a significant and valuable community asset. And, perhaps because the newly independent government was still establishing itself, it was not able to develop some form of joint venture that could have enabled the plantations to continue.

## **Community or Private Reforestation?**

There may be a limit to the extent to which degraded lands can be reforested by communities. One of the reasons why various forms of shared land tenure probably evolved was because it enabled the provision of mutual protection in the face of endemic warfare and feuding. In addition, people often needed help beyond that which could be provided by the nuclear family when larger farm or construction work had to be done. Under these circumstances the benefits that arose from being a member of the community outweighed the advantages of being a free agent. The institutions and moral norms in villages and clans might be seen as a way of penalizing opportunistic behavior that threatened this natural insurance system. Agriculture could be carried out as a private household activity but it was done so on communal land.

However, in more recent times, changed economic incentives are prompting people to reassess these institutional relationships. One important factor has been the advent of perennial cash crops such as coffee, cocoa, rubber and oil palm. Most traditional systems recognized that special rights were acquired by someone who felled a patch of forest and planted a crop. Similarly the special rights of a farmer who established a rice paddy field were recognized even while the nearby natural forest remained a common property resource. This was because the community realized that a person had invested effort to create the new resource and that this deserved recognition. But the intensification of agriculture, the spread of cash crops and the rise of land values has prompted a

consolidation of permanent individual property rights. More families now prefer to pass their agricultural assets on to their biological children rather than to the community as a whole. In some cases membership of the community may still be useful such as when the new assets are distant from the village and need special protection which the community can provide more easily than an individual. But even this advantage shrinks when the lands are near the household's own dwelling.

Tree-planting certainly triggers these types of problem and most households are likely to prefer to invest effort in reforestation on lands that they alone control. Part of the reason is because not all members of a community may be equally interested in tree plantations and it is difficult to develop sharing mechanisms that reflect the contribution individuals make to establish new plantings. A second is because community control restricts rapid access to these resources in times when a household suddenly needs cash for medical emergencies or because of unexpected crises such as funerals. Community reforestation may continue to succeed in strong traditional communities but is less likely to be successful among communities of recent migrants lacking leadership and strong social cohesion.

The privatisation of traditional communal land for tree planting poses a number of problems. Not the least of these is that while some people may benefit others may lose out; elites can gain control of some of the best of the land once owned by the community. This means that, whatever the economic advantages, privatization can lead to a variety of social problems within the community involving social cohesion, stability and identity. In these fluid situations it is very difficult for bureaucracies to keep track of ownership claims and land boundaries. One middle pathway appears to be developing in some parts of the Pacific. In this case, forms of individualized, secure and transferable property rights based on customary ownership are being developed rather than individualised freehold land (Fingleton 2005). For some communities this approach may offer the best of both worlds.

## Conclusions

The last 100 years of land use practices in the world's tropical forest landscapes have left an impoverished and increasingly threatened biota as well as many poor people living in and around these areas. The circumstances of many of these people have been worsened by 'development' because they have lost the forest's resources as well as legal access to these lands. There has been considerable debate between conservationists and development specialists over how these twin problems of biodiversity loss and poverty should be solved. Some argue for simple unilateral approaches (i.e. tackle either conservation or poverty but do not try to achieve both at the same location) while others have sought to find methods of solving both problems at once. These Integrated Conservation and Development Projects have had limited success to date although this is not necessarily because the concept is flawed. On the contrary, it may be because it has simply been approached in the wrong way.

There are reasons for thinking there may be opportunities to tackle both problems by reforesting some of the large areas of degraded lands that have now accumulated across the region. Reforestation would add habitats and heterogeneity to these landscapes and help complement the existing network of protected areas. In addition, reforestation could improve the asset base of rural households, diversify their incomes and help reduce their vulnerability to economic and other unexpected contingencies.

But it is important to keep these potential advantages in perspective. Some forms of reforestation will make only modest contributions to biodiversity conservation (and may take time to do so). Likewise not all poor people will be interested in reforestation, especially those with only small areas of land to use or with limited resources with which to carry it out. Nonetheless, carefully devised forms of reforestation could help with both tasks. Further, there is empirical evidence that many rural households are interested in being involved once they have what they believe is an appropriate degree of tenurial security over the land they are using. Tenure can be a problem because many people now live in an ambiguous political and institutional landscape where land tenure and usufruct rights can be limited or entirely absent.

The type of reforestation employed and its capacity to generate conservation or livelihood benefits will depend on the type of land available and its landscape context. Much of the land likely to be available for reforestation will be marginal agricultural land. This will determine the types of species and planting systems that can be used and in some cases only exotic species may be able to tolerate these sites. The landscape context is important because it will determine the extent to which new plantations will facilitate the movement of native biota (wildlife as well as seeds) across the landscape. The landscape context is also important because it influences the economic value of any plantation; isolated plantations distant from roads or transport will be less attractive than those closer to markets. Plantation owners must take these matters into account when setting their objectives. The next chapter discusses the different forms of reforestation in a little more detail as well as their advantages and disadvantages.

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